

Improvements add up to quality, efficiency

Later this year, Denver Water will complete the last of a series of projects that add up to \$67.5 million in improvements to its Marston Treatment Plant and the piping system that sends drinking water on its way into the city. The work included \$1 million for the remodeling and updating of the Water Quality Laboratory, which last year conducted 44,539 microbiological and chemical tests from 12,965 samples of water from throughout the water system.

The efforts expended and the money spent demonstrate the water department's commitment to bringing its customers the best tasting, highest quality drinking water possible. Renovations at the plant ensure quality treatment and delivery efficiency. Upgrades at the Lab mean our scientists have better facilities and instrumentation to test for lower levels of contamination that might be in both raw and treated water. We do it to meet regulations and maintain a tradition of excellence that has kept pace with technological advancements, increased public awareness and the demands of a growing city.

The Lab's analysts monitor and test Denver's water from sources in the mountains to the mains on your street. We even go beyond our system to look for contaminants. For instance, there is no lead in drinking water that leaves Denver Water's plants, but there might be in your house if you have lead plumbing. So, every three years, the Lab reports the samples from an assortment of homes in the metro area for lead and copper. Happily, the findings are consistently below action levels.

Last year there was alarm over lead in drinking water in homes and schools in Washington, D.C. We responded voluntarily by sending water quality specialists to check the drinking fountains at 20 older elementary schools and 19 daycare and learning centers in Denver. Their tests of more than 330 fountains detected elevated levels at only five, which were remedied by flushing.

In fact, we've never been cited for violating a health standard. Since inception in 1918 as a municipal agency, the department has been treating and testing its water, and our findings always have been available to the public. This publication is Denver Water's annual summary of where our water comes from, what's in it, and how we treat, protect and deliver drinking water. We've also compared our test results with federal and state regulations, and we're pleased to submit another unblemished report.

Esta información es importante. Si no la pueden leer, necesitan que alguien se la pueda traducir. Información en español, llame al 303-893-2444.

Notes about water

ALL DRINKING WATER, including bottled water, might reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. Immunocompromised individuals – such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, those with HIV-AIDS or other immune system disorders, and some elderly and infants – can be particularly at risk of infections. These people should seek advice about drinking water from their health care providers. For more information about contaminants and potential health effects, or to receive a copy of the U.S. Environmental Protection Agency and the U.S. Centers for Disease Control guidelines on appropriate means to lessen the risk of infection by *cryptosporidium* and microbiological contaminants, call the EPA *Safe Drinking Water Hotline* at 1-800-426-4791.

SOURCES OF DRINKING WATER – both tap and bottled water – include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land

or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material and can pick up substances resulting from the presence of animals or from human activity. Contaminants that might be present in source water include:

MICROBIAL CONTAMINANTS, such as viruses and bacteria that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.

INORGANIC CONTAMINANTS, such as salts and metals, which can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

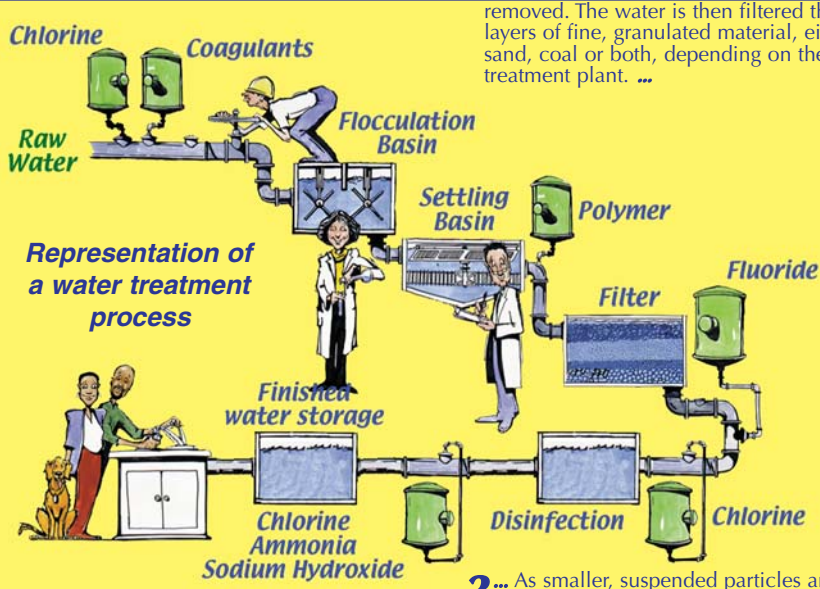
PESTICIDES AND HERBICIDES that may come from a variety of sources, such as agriculture, urban storm water runoff and residential uses.

ORGANIC CHEMICAL CONTAMINANTS, including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and also may come from gas stations, urban storm water runoff and septic systems.

RADIOACTIVE CONTAMINANTS, which can be naturally occurring or be the result of oil and gas production and mining activities.

1 The treatment process consists of five steps – coagulation, sedimentation, filtration, corrosion control and disinfection. First, raw water from terminal reservoirs is drawn into mixing basins at our treatment plants, where we add alum and polymer. ...

2 ... That causes small particles to adhere to one another, making them heavy enough to settle into a basin from which sediment is removed. The water is then filtered through layers of fine, granulated material, either sand, coal or both, depending on the treatment plant. ...



4 ... Denver Water carefully monitors the amount of chlorine added to maintain quality of water at the farthest reaches of the system. Fluoride occurs naturally but is also added to treated water, and pH is maintained by adding alkaline substances to reduce corrosion in the distribution system and your home or business.

3 ... As smaller, suspended particles are removed, turbidity diminishes and clear water emerges. Finally, as protection against any bacteria and viruses that might remain, chlorine and ammonia are added before the water flows to underground reservoirs throughout the metro distribution system and into your home or business. ...

The Glossary

Some of the terms, abbreviations and symbols contained in this report are unique to the water industry and might not be familiar to all customers. In addition to explanations included in the footnotes to our Water Quality Roundup and other features on the other side, below are definitions to some other key terms:

CONTAMINANT: A potentially harmful physical, biological, chemical or radiological substance.

MAXIMUM CONTAMINANT LEVEL (MCL): Highest level of a contaminant allowed in drinking water. MCLs are set as close to the Maximum Contaminant Level Goal as feasible using the best available treatment technology.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

PARTS PER MILLION (PPM): Equivalent to milligrams per liter. One ppm is comparable to one drop of water in 55 gallons.

PARTS PER BILLION (PPB): Equivalent to micrograms per liter. One ppb is equivalent to one drop of water in 55,000 gallons.

PICO CURIES PER LITER (pCi/L) AND 4mREM/YR: Measures of radioactivity. (See below.)

4mREM/YR: Four milliroentgen equivalent man/year. A maximum contaminant level standard based on dosage; about 50 picoCuries per liter.

SECONDARY MAXIMUM CONTAMINANT LEVEL (SMCL): Non-enforceable, recommended limits for substances that affect the taste, odor, color or other aesthetic qualities of drinking water, rather than posing a health risk.

Maximum Residual Disinfectant Level (MRDL): Highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG): Level of a drinking water disinfectant below which there is no known or expected health risk. MRDLGs do not reflect benefits of the use of disinfectants to control microbial contaminants.



Crypto & Giardia: The search goes on

Denver Water has tested for *Cryptosporidium* and *Giardia* in both raw and treated water since the 1980s and has never detected a viable indication of either in drinking water.

Crypto and Giardia are microscopic organisms that, when ingested, can result in diarrhea, cramps, fever and other gastro-intestinal symptoms. Crypto and Giardia must be ingested to cause disease, and they can be spread through means other than drinking water.

Most people readily recover from the symptoms, which can cause more serious illness in people with compromised immune systems. The organisms are in many of Colorado's rivers and streams and come from animal wastes in the watershed. Crypto and Giardia are removed by effective filtration at the treatment plant. Disinfectants also kill Giardia.

Keeping it clean

Denver Water's three treatment plants – Foothills, Marston and Moffat – are constantly maintained, evaluated and upgraded to stay abreast of advancements in technology and governmental regulations.

After treatment, drinking water is fed by both gravity and pumps to an enclosed system of underground, clear-water reservoirs scattered throughout the metro area and then to your home or business.

Some 2,700 miles of pipe carry water to 1.1 million customers. Last year, we treated 59.4 billion gallons of water, an average of 162.7 million daily.

Protecting your water continues to your tap in these ways:

- Any time a Denver Water crew excavates a pipe – to repair a break or for routine maintenance – or lays a new one, the pipe and all the parts that come with it are disinfected. Before the pipe is returned to service, in addition to disinfection, it is flushed with fresh water to assure high quality of the system.
- Throughout Denver Water's service area, water quality investigators draw samples regularly from more than 200 locations to make sure water meets precise safety standards.
- Through an intricate, computerized network of more than 600 data, alarm and control points, state-certified operators monitor and control the entire water system 24 hours a day. This system includes a network of water quality sensors that provide continuous surveillance of your water.
- The city's underground reservoirs – which provide a constant supply of water even when demand fluctuates greatly – are inspected, drained, cleaned and disinfected at least yearly.



Mains are disinfected before they are put into service.

DENVER WATER’S TREATED WATER QUALITY ROUNDUP

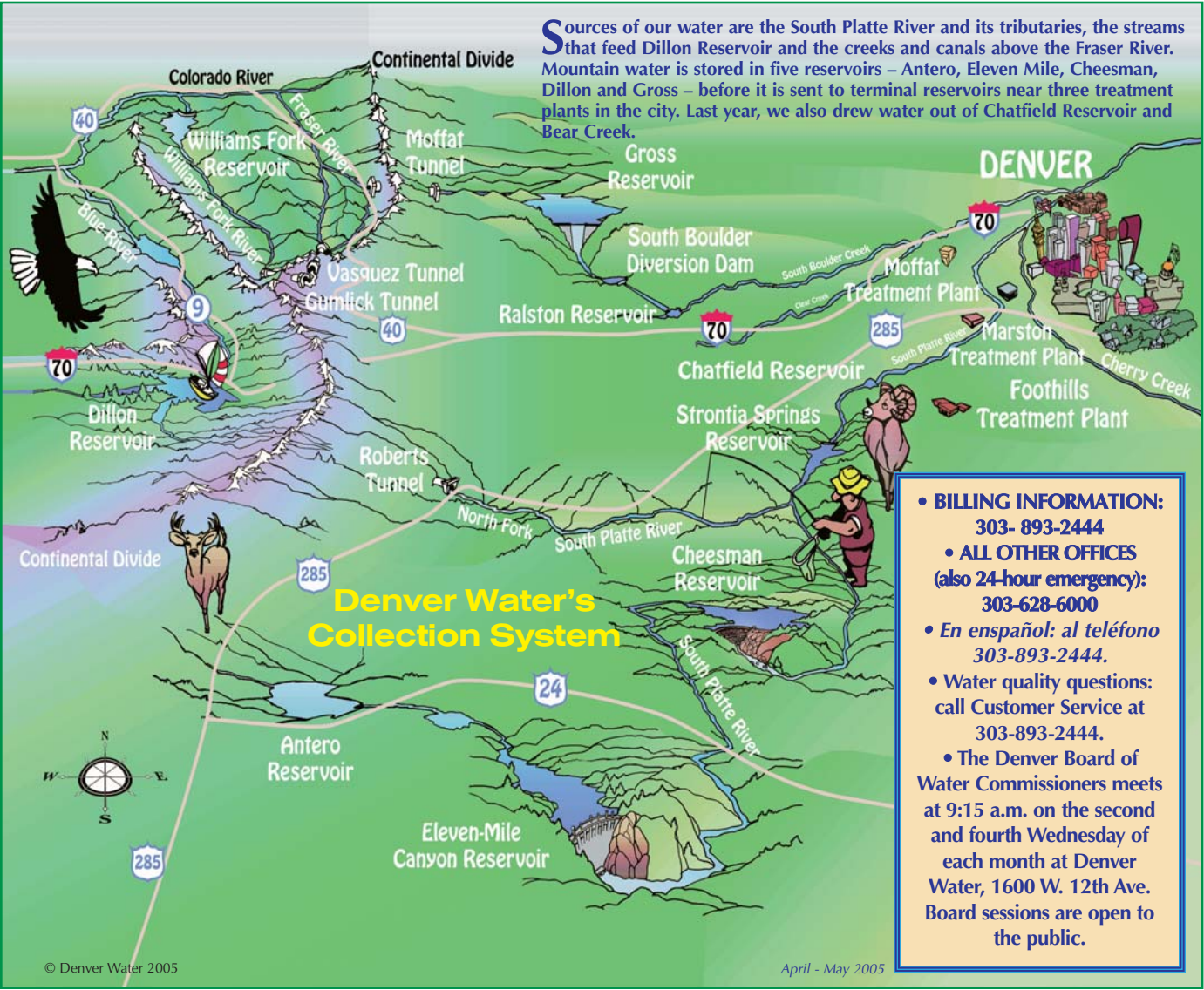
REGULATED AT THE TREATMENT PLANT								
Substance	Violation	Sampling Period	MCLG*	MCL*	Denver’s Average	Range of Detections	Sources of Substances	Footnotes
<i>Metals</i> Barium in parts per million (ppm)	No	Monthly	2	2	0.042	0.016 - 0.047	<i>Erosion of natural deposits; discharge of drilling wastes</i>	[*] MCLG and MCL: Maximum Contaminant Level Goal and Maximum Contaminant Level. ¹ PicoCuries per liter. ² Equivalent dose. EPA considers 50 pCi/L to be the level of concern for beta particles. ³ Non-detect: Laboratory analysis indicates that the constituent was not present. ⁴ Not applicable. ⁵ Two (2) is the Secondary Maximum Contaminant Level, which is not enforceable. Exceeding the Fluoride Secondary Maximum Contaminant Level of two milligrams per liter triggers public notification. ⁶ Treatment Technique: a required process intended to reduce the level of a contaminant in drinking water.
<i>Radiological</i> Beta/photon emitters in pCi/L ¹	No	Quarterly	0	⁴ mrem/yr ² Equival. dose 50	n/d ³	n/d - 4	<i>Decay of natural and man-made deposits</i>	
Uranium in parts per billion (ppb)	No	Monthly	n/a ⁴	30	n/d	n/d	<i>Erosion of natural deposits</i>	
<i>Inorganics</i> Fluoride in ppm	No	6 times daily	4	4 ⁵	0.91	0.13 - 1.58	<i>Erosion of natural deposits; water additive that promotes strong teeth</i>	
Nitrate in ppm	No	Monthly	10	10	0.20	0.06 - 0.27	<i>Erosion of natural deposits; leaching from septic tanks, sewage</i>	<div>Información en español</div> <div>Esta información es importante. Si no la pueden leer, necesitan que alguien se la pueda traducir.</div>
<i>Organics</i> Total Organic Carbon as removal ratio	No	Running Annual Average	n/a	TT ⁶	Lowest running annual removal ratio 1.03 1.41 1.12	0.98 - 1.18 Foothills Treatment Plant 1.35 - 1.48 Moffat Treatment Plant 1.02 - 1.28 Marston Treatment Plant	<i>Naturally present in the environment</i>	
Colorado Public Water System I.D. No. 116001								

REGULATED IN THE DISTRIBUTION SYSTEM								
<i>Organic Disinfection By-Products (DBPs)</i> Total Trihalomethanes ¹ (TTHM) in ppb	No	Monthly	0	80	Highest RAA* 33	21 - 42	<i>By-product of drinking water chlorination</i>	[*] Running Annual Average. ¹ Total Trihalomethanes: By-products of the disinfection process. ² Less than 5% positive in any month. ³ Maximum Residual Disinfectant Level (MRDL): Highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants. ⁴ Turbidity has no known health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth.
Haloacetic acids (HAA ₅) in ppb	No	Monthly	n/a	60	20 (RAA)	11 - 28		
<i>Microbiological</i> Total Coliform as Absent or Present	No	Daily	0	5% ²	Highest monthly percentage 0.59% April '04	13 positive detects out of 6,185 samples, or 0.21%	<i>Naturally present in the environment</i>	
<i>Disinfectant</i> Chloramine as Cl ₂ in ppm	No	12 times daily	n/a	MRDL as Cl ₂ ³ 4	1.56	0.95 - 1.98	<i>Drinking water disinfectant used to kill microbes</i>	
Turbidity ⁴ in Nephelometric Turbidity Units	No	12 times daily	n/a	TT	Highest Level in 2004 0.17	Monthly samples less than 0.3 NTU 100%	<i>Soil runoff</i>	

UNREGULATED CONTAMINANTS ¹								
<i>Organic Disinfection By-Products (DBPs)</i> Bromodichloromethane in ppb	No	Monthly	n/a	n/a	<u>Averages</u> 8.9	1.2 - 11.6	<i>Component of TTHM, by-product of drinking water chlorination (See chart above)</i>	¹ Unregulated compounds are analyzed for consideration for future regulation. ² Secondary Maximum Contaminant Level is a recommended level and is not enforceable. What's on this chart The Water Quality Lab at Marston, key to our quality assurance program, last year ran 44,539 tests from 12,965 samples while looking for more than 200 possible contaminants, many of which aren't regulated or detected. As the charts on this page reflect, very few of these substances were found in treated water, all were well below allowed levels and none represents a health concern. For a full list of 2004 test results, call Maria Rose at 303-628-5996. A copy of the state health department's "Source Water Assessment Report" also can be obtained by calling Maria Rose.
Chlorodibromomethane in ppb	No	Monthly	n/a	n/a	3.4	n/d - 4.7		
Chloroform in ppb	No	Monthly	n/a	n/a	24.4	4.4 - 37.9		
Chloral hydrate in ppb	No	Monthly	n/a	n/a	2.4	0.6 - 3.5	<i>By-product of drinking water chlorination</i>	
Chloropicrin in ppb	No	Twice Annually	n/a	n/a	0.5	n/d - 0.7		
Cyanogen chloride in ppb	No	Annually	n/a	n/a	3.6	0.8 - 4.9		
Haloacetonitriles (HAN) in ppb	No	Twice Annually	n/a	n/a	5.2	0.9 - 7.2		
Haloketones (HK) in ppb	No	Twice Annually	n/a	n/a	4.5	1.3 - 6.1		
Total organic halides (TOX) in ppb	No	Annually	n/a	n/a	226	115 - 319		
<i>Inorganics</i> Sulfate in ppm	No	Monthly	250	(SMCL) ² 250	59.3	15.2 - 67.8	<i>Naturally present in the environment</i>	
Sodium in ppm	No	Monthly	n/a	n/a	21.0	6.0 - 24.0		

REGULATED AT THE CUSTOMER’S TAP ¹								
Substance	Violation	Sampling Period	MCLG	Action Level ²	90th Percentile Value	No. of Samples Exceeding AL	Sources of Substances	Footnotes
<i>Inorganics</i> Lead in ppb	No	Triennially	0	At the 90th Percentile 15	9 from '02	1 out of 51	<i>Corrosion of household plumbing</i>	¹ Lead isn't found in Denver's treated water. However, it might be present in a home's or business's plumbing. Because Denver Water has consistently been below lead and copper Action Levels, the state health department permits reduced monitoring once every three years. The next sampling for lead and copper will be this summer. Figures in this report are from 2002.
Copper in ppm	No	Triennially	1.3	1.3	0.19 from '02	0 out of 51		

² Action Level: Concentration of a contaminant that, if exceeded, triggers treatment or other requirements that a water system must follow.



More about lead

Infants and young children are typically more vulnerable to lead in drinking water than the general population. It is possible that lead levels at your home might be higher than at other homes in the community as a result of materials used in your home's plumbing. If you are concerned about elevated lead levels in your home's water, you might wish to have your water tested and flush your tap for 30 seconds to two minutes before using tap water. (Always use cold tap water for food and beverage preparation. Hot tap water can leach higher amounts of lead and other metals from plumbing or your hot water tank.) Additional information is available from the U.S. Environmental Protection Agency's Safe Drinking Water Hotline at 800-426-4791.

Mountain water sources

Denver's drinking water comes from rivers, lakes, streams, reservoirs and springs fed by high-quality mountain snow runoff. The water comes entirely from surface sources over a watershed that covers 3,100 square miles on both sides of the Continental Divide. The farthest reaches of this system are more than 105 miles away, and the water is diverted and delivered to our treatment plants in the city by gravity through a complex system of streams, canals and pipes. Prior to treatment, the water flows into three terminal reservoirs where access is limited to further ensure the quality of the water. After treatment, drinking water is fed by both gravity and pumps to a system of underground, clear-water reservoirs and then to your home or business. Some 2,700 miles of pipe carry water to Denver Water customers.